Miniature Universal Sampling System for Scientific Instruments

Completed Technology Project (2011 - 2012)

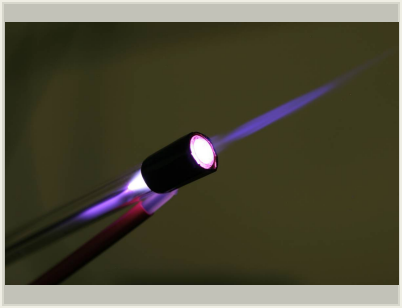
Project Introduction

Characterize the performance of a low-temperature plasma discharge for use as an ion source, an ablation tool, and a sterilization tool.

The ion source investigation consisted of coupling the low-temperature plasma discharge source to a mass spectrometer. The goal of this investigation is to provide insight into the ion yield and degree of fragmentation of the low-temperature plasma source relative to conventional electron-impact ion sources, as well as providing insight into technical requirements relating to gas usage, and vacuum requirements. Answering these questions will also address the larger question: is a plasma discharge ion source feasible for planetary exploration? The ablation study with the low-temperature plasma consisted of prolonged exposures of metal surfaces to the low-temperature plasma discharge and analyzing surface modifications with scanning electron microscopy. The intent of this study is to identify whether a plasma source can be used to ablate material from a surface and provide depth profiling of that surface when used in conjunction with a mass spectrometer. Sterilization of a surface with plasmas can proceed through passivation where contaminants are simply desorbed from the surface or through deactivation where biological contaminants on a surface are altered or destroyed following exposure to the plasma. This sterilization study with the low-temperature plasma probe focused on deactivation and involved exposure of Bacillus subtilis samples to the low-temperature plasma discharge to ascertain its effectiveness in deactivating these spores.

Anticipated Benefits

Plasma-based sampling systems offer three key advantages over other sampling systems: 1) they do not require sample preparation, 2) they can analyze in real-time, and 3) they do not rely on volatility - meaning they are capable of sampling solids, liquids or gases. The plasma system developed in this project was successfully interfaced to a quadrupole ion trap mass spectrometer. The combined system was used to perform continuous sampling at atmospheric pressures.



Project Image Miniature Universal Sampling System for Scientific Instruments

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

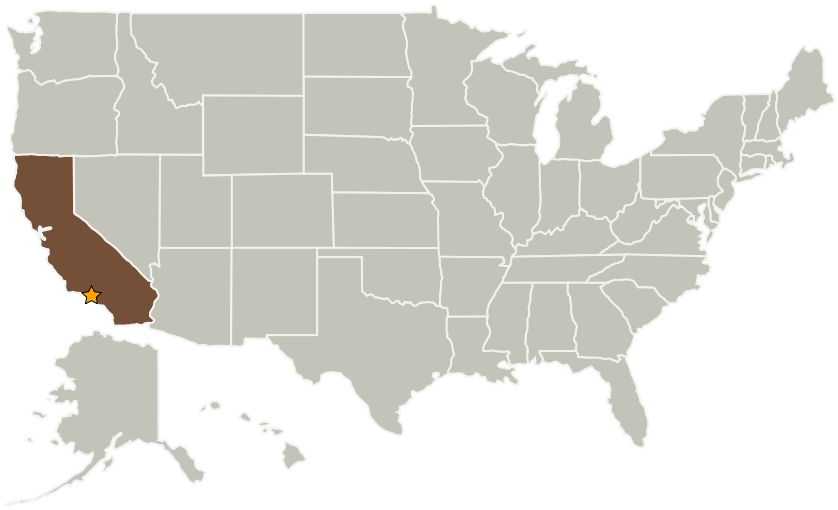
Responsible Program:

Center Innovation Fund: JPL CIF

Miniature Universal Sampling System for Scientific Instruments

Completed Technology Project (2011 - 2012)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Management

Program Director:
Michael R Lapointe

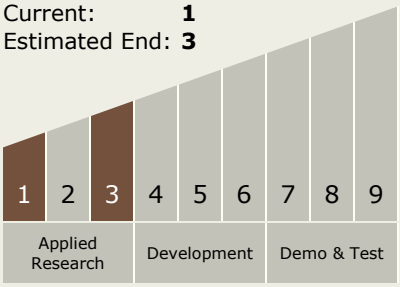
Program Manager:
Fred Y Hadaegh

Project Manager:
Jonas Zmuidzinas

Principal Investigator:
John A Macaskill

Technology Maturity (TRL)

Start: **1**
Current: **1**
Estimated End: **3**



Technology Areas

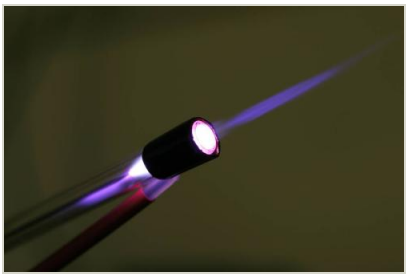
Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.3 Sample Handling

Miniature Universal Sampling System for Scientific Instruments

Completed Technology Project (2011 - 2012)

Images



63.jpg
Project Image Miniature Universal Sampling System for Scientific Instruments
(https://techport.nasa.gov/image/1158)